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FOR

THE INEXPERIENCED

BY

HUBERT WALTER

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H. C. B.

PREFACE

THIS handbook is intended to explain as simply as possible the things about electric light that everyone ought to know who either uses it or intends to use it. When the average man comes to consider the question of putting electric light into his house, he is immediately confronted by a number of technical expressions which he does not understand. He is further called upon to decide a number of points as to which, having never come across them before, he is incapable of giving a reasoned judgment. Naturally, therefore, he is obliged to rely largely on the advice of a professional electrician.

But even the best expert advice that money can buy is not, in itself, enough to ensure the best lighting of a house. Technical excellence of workmanship and materials, indeed, may be had by employing a thoroughly competent contractor, supervised, preferably, by an indepen-

dent consulting engineer; but it is on the attention devoted to various matters of opinion and taste which the intending 'consumer' alone can properly decide that the real success of an installation depends.

The result of leaving these little details to the 'man' is familiar enough. For one 'well-lighted' house one finds a dozen in which the wiring is badly planned, the switches thoughtlessly arranged, the fittings wrongly placed, the lamps unsuitable, the shades ugly. There is no excuse nowadays for this state of things. Electric light in the house is no longer a new-fangled and inscrutable toy. Yet the householder, as a rule, still lacks that little knowledge of 'the things to look out for' which would enable him to interpret a specification, avoid the more obvious of the common mistakes, and get for his money the most advantageous return. The aim of this book is to help him.

Even the reader who is already a 'consumer' will, it is believed, find a good deal in these pages that he did not know before. He may agreeably employ his leisure in discovering what parts, if any, of his own installation are beyond the reach of criticism.

It is obviously impossible in a book of this

compass to consider in detail the lighting of every kind of house. All that can be done is to discuss the principles which apply to all houses, indicating, where necessary, the modifications called for by particular cases. For all practical purposes a town house of moderate size—such as the agents describe as having 'three or four reception-rooms, eight to ten bedrooms, and the usual offices'—serves best as an illustration.

Being intended primarily for amateurs, the language used throughout is as untechnical as accuracy will permit. The use of conventional expressions about electricity, such as 'flowing along' a wire, is well recognised, and saves a deal of unpleasantness.

H. W.

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CHAPTER I

HOW A HOUSE IS WIRED

Cables—Voltage—Continuous and alternating currents—A circuit—Cut-outs—The main switch—The meter—Board of Trade units—Distributing-boards—Wires—Compo. and steel tubes—Wood casing.

Currents and Circuits.

THE electric current used for lighting purposes is produced, as everybody knows, by a dynamo, and laid on by the Supply Company in **mains** or **cables** which run under the pavements and streets. The consumer, as a rule, has no choice as to what sort of current he will have, but has to take whatever he is given, just as he has to take whatever water is laid on. If he has a choice between, say, a 100-volt current and a 200-volt current, he should take—and, if he can, keep—the 100-volt.

A **volt** (which rhymes with 'jolt') is a unit of

electric force or energy. No unprofessional person need trouble about its scientific definition. The reader may safely think of it as a unit of *pressure*, in the same way as he thinks of a pound when he says that a boiler works at 150 pounds or 200 pounds to the square inch. Just as a pipe or boiler is made to stand a certain steam pressure in pounds, so a wire or lamp is made to stand a certain electric pressure in volts. The tendency of supply companies is to increase their voltage, because by so doing they are able to send more energy over the same mains, and thus avoid the great expense of laying new ones. The advantage, however, is entirely on the side of the company. The consumer gets no better light, his lamps do not last as long, and he has to take greater precautions against fire.

Currents, besides differing in voltage, are either **continuous** or **alternating**. In the former the electricity flows continuously in one direction; in the latter it changes its direction alternately, in some cases as often as fifty or sixty times a second. It makes no difference to the consumer which he has, except that he cannot use an alternating current to charge accumulators.

The company, having received instructions to supply the consumer with current, cause him first to sign an agreement setting forth the

conditions under which they will do so, and then proceed to make a connection between their mains and the consumer's premises. The actual junction is usually placed, for convenience of inspection, in a small manhole constructed in the pavement in front of the house.

Most people realize that the use of electricity requires a complete **circuit**, so that the current may go 'all the way there and back.' That is to say, there must be a continuous metallic path for the current from the dynamo at the generating station to every lamp that is alight, and a quite separate continuous metallic path back to the dynamo. If a break occurs at any point in either of these two metallic paths—they are actually copper wires of suitable dimensions—the current instantly ceases to flow. Or, again, if a leak occurs in the **insulation**—or covering impervious to electricity—with which the wires are coated, so that the current can escape into the earth, which it will always do if it gets a chance, the result will be a diminution, or perhaps complete failure, of power at the point where it is required to do its work.

In any case, then, there must be two wires throughout the whole of an installation, each wire representing what is known as a 'pole' of the circuit. The supply company, therefore, connect two stout wires to their mains, and lead

them into the basement of the house, passing them through a pipe, if necessary, for protection.

Cut-outs and Switches.—The Meter.

In the nearest available position to the point where the wires come in the company fix the **main cut-out.**

Cut-outs and their ways are so important a factor in electric lighting that it is worth while to take pains to understand them thoroughly. A cut-out is an arrangement whereby a gap is made in one or both of the wires (according as it is a 'single-pole' or 'double-pole' cut-out), which, if left open, would completely interrupt the circuit. These gaps, however, are bridged over when everything is in working order by **fuses**—that is to say, pieces of tin alloy wire of such a thickness as to allow the passage of that amount of current only which the wires throughout the house can safely carry. By this means the risk of fire is almost entirely precluded.

If, for instance, a **short circuit** (familiarly known as a 'short') occurs somewhere in the house—which means that the current accidentally passes from one wire of any pair to the other without going through a lamp—there is instantly a great rush of current through the cut-out from the mains. It is just as if water in a pipe which had been painfully trickling under pressure

through a strainer suddenly found a way round which enabled it to avoid the obstruction. There would, of course, be a greatly increased flow of water. But a wire will only carry a certain amount of current in comfort, and as soon as that amount is exceeded it begins to get hot. In the absence of a suitable fuse, therefore, the temperature of the wires would quickly become so great that first the insulation, and then anything inflammable within reach, would be set on fire. But the fuse, being made of a metal which melts at a comparatively low temperature, fuses, or 'goes,' or 'blows,' as soon as the amount of current passing exceeds the normal amount by 50 per cent.—that is to say, before the wires have got hot enough to do any harm. When the fuse 'goes,' the bridge over the gap is broken, the current is interrupted, and any lamp on the circuit which was alight goes out instantly, thus drawing attention to the fact that something is wrong.

The main cut-out is made of glazed white china, and often has an iron cover with little glass windows in the top.

Within the shortest possible distance of the main cut-out is fixed the **main switch.** This is the tap which turns on or off the whole supply of the house. The principle of all switches is the same: there is a gap in the circuit which the

switch either fills or leaves open, thus permitting or preventing the flow of current as may be desired. A main switch should be 'double-pole' —that is to say, it should act upon both of the two main wires or 'leads' (to rhyme with 'feeds'), instead of upon one only, as the ordinary switch about the house does.

It is important that the consumer should know *how* to turn off his main switch; he may never need the knowledge, but if anything untoward, such as a fire, happens to the installation, he will find it extremely useful. There is no more mystery about it than in turning off gas 'at the main.' But the switch must be easily accessible at all times, and should be at least within reach of a person standing on a chair. If it is nearer the floor, care must be taken that it is not surrounded, as too often happens, with heavy lumber.

The next thing on the main circuit after the main switch is the **meter.** This is like a little gas-meter, with hands on a dial in front showing the amount of current which has passed. The meter is supplied by the company, who generally charge a small quarterly rent, and will have it tested, if its accuracy be doubted, at the consumer's expense. As a rule, however, meters are fairly accurate.

The figure on the dial are **Board of Trade**

units, and the company charge so much a unit. Sometimes the meter is made to record a less number than the actual units, and then the reading is multiplied by a 'constant' quantity to make it right. A Board of Trade unit is, roughly speaking, the amount of current which will keep an ordinary eight-candle-power lamp burning for thirty-two hours. Some companies charge the same amount—say, fivepence a unit—for any number of units. Others charge, perhaps, sixpence for a certain number of units, and allow a rebate on anything over that number. There are various ways of doing it, but in any case the consumer will be expected to pay once a quarter.

Emerging from the meter, the leads pass to the **main distributing-board**, often called a **fuse-board**. On this board, which is carefully insulated from the wall, the main leads end in two solid brass bars. There is generally a partition dividing these two bars completely from each other, and practically dividing the distributing-board into two separate halves. Connected with each of the bars is a row of brass clips. Close to, and corresponding with, each of these clips is another similar clip in a second row. Thus, in each half of the board there are two rows of clips. The clips in the upper and lower rows, respectively, of each half of the board are

the points from which the branch circuits leading to the various floors of the house start, and to which they return. That is to say, a circuit will start from the first clip in the upper row of the top half, and return to the first clip in the lower row of the bottom half. The gaps between each corresponding pair of clips, whether in the top or in the bottom half of the board, is bridged over by some device—a piece of china or other non-conducting material—in which a fuse is fastened. Each branch circuit is thus protected by two fuses.

The fuse-board, then, is essentially a collection of cut-outs. There should also be a subsidiary distributing-board on each floor, from which circuits run to various rooms or groups of lamps. But in a small house these minor distributing-boards are often omitted. There should be no fuses except on distributing-boards.

Whatever be the number of distributing-boards in the house, they should all be easily accessible, and have the circuits numbered or marked in such a way that, when a fuse 'goes,' it may be replaced without a moment's delay. It is a mistake to put them in positions where they cannot be reached without a tall pair of steps. Every fuse-board should be covered with a neat box, having a lock and key and a glass window in the 'lid.' At least two extra fuse-

carriers, with fuses properly inserted, should be kept inside the cover of every fuse-board.

Wires, Tubes, and Casings.

From the main distributing-board the branch circuits pass upwards through the house to the various floors. The dimensions of the **wires** are, of course, proportioned to the amount of current which the wires are intended to carry, and elaborate rules have been laid down for determining these dimensions. Among the many mysterious expressions which you will find in the specification for your installation will be a reference to conductors of '(so many) megohm grade.' If your specification states, as it should, that the work is to be carried out in accordance with the rules of a certain insurance company, and if, as is to be hoped, you are employing a thoroughly trustworthy contractor, you need not worry about the inner meaning of a 'megohm.' The expression merely describes the kind of wires which are considered suitable to carry the amount of current required by your installation. A good margin of safety is always allowed, so that you need not be afraid of substituting a sixteen-candle-power lamp for an eight-candle-power at any moment that you think fit.

Whatever their size, all hidden wires are most carefully insulated with indiarubber and tape.

Throughout the whole of their course through the house until they reach the actual points in the rooms, passages, hall, or staircase, to which the fittings are connected, the wires are enclosed for protection either in a metal pipe or in a wooden casing. Until comparatively recently the kind of pipe used was that known as **compo.** (composition) **tube,** the chief disadvantage of which was that it failed to protect the wires from their deadliest enemy—nails driven into the walls or floor.

For some mysterious reason, a nail and a compo. tube appear to have an affinity for each other. So much is this the case that to drive a nail into a floor or wall may almost be said to be an infallible means of locating the position of any tube hidden under the surface. This peculiarity of compo. tubes was much presumed upon by carpenters and picture-hangers, who seem to take a malignant pleasure in destroying the work of the electrician. The writer has seen, in a four-foot length of compo. tube taken up from under a floor, no fewer than *six* places where nails had pierced the tube and destroyed the insulation! The carpenter had, indeed, been unnecessarily murderous, for, as they say at inquests, 'any one of the wounds would have proved fatal.'

With **steel tubes,** which have now super-

seded 'compo.,' this difficulty is got over. Steel tubes should always be used in walls, and may be used for *all* hidden work.

There are many positions, however, in which, given good workmanship and materials, **wood casing** answers equally well. The appearance of wood casing is familiar to any observant person. The wires are laid in two separate channels, and the whole is covered by a strip of wood fixed down at intervals of 9 to 12 inches with screws. The advantages of wood casing are that it is very cheap to put up and very easily opened, if necessary, to remedy defects in the wiring. When used *on* the walls of rooms, its natural ugliness may often be mitigated by the ingenious employment of mouldings harmonizing with the surrounding decorations. Even the ordinary casing is not very conspicuous if run up the corner of the room or along the top of the skirting-board. In any case, of course, it must not be covered with wall-paper, but be painted as inoffensively as possible. When used under floors, sufficient space must be left between the boards and the casing to avoid the possibility of a puncture from a nail or screw.

Wherever wires pass under a floor, the boards covering them should be screwed down, not nailed —not only to reduce the risk of a puncture but to enable them to be got at easily, if required.

CHAPTER II

ACCESSORIES

Ceiling-roses — Wall-sockets and plugs — Position of sockets — Flexible — Lamp-holders — Shade-carrier — Key-holder — Cord-grip — Tumler switches — Two-way switches — Intermediate switches — Pear switches — Position of switches.

In whatever way they may be protected, the wires arrive in due course at the points where they are to be connected with the fittings. If the fitting happens to be a bracket, the ends of the wires are merely soldered on to the wires of the bracket without any intervening complication. But in the case of pendants and portable fittings further accessories are required.

Ceiling-Roses and Wall-Sockets.

Wherever it is intended that a light shall hang from a ceiling, a **ceiling-rose** is fixed. This may be described as a circular plate of porcelain, about $2\frac{3}{4}$ inches in diameter, screwed on to a circular piece of wood, which in its turn is securely fixed to the ceiling. The ends of the circuit wires pass through holes in the wood and porcelain, and are fastened to brass screws arranged on the underside of the latter. The wires leading to the lamp are fastened to similar

brass screws, but the construction of the rose should prevent any weight from coming on them. The whole affair is covered by a more or less dome-shaped porcelain cap, screwing bodily on to the porcelain base, with a hole in the middle through which pass the wires leading to the lamp. The pernicious practice, on the part of inferior workmen, of tying a knot in the wires at this point is equally common, unnecessary, and against the rules. The nakedness of the white porcelain may be veiled, if desired, with ornamental metal leaves.

A **wall-socket** is a slightly more complicated thing. It is fixed at any point of the wall of a room where it is intended to connect a lamp by means of a 'flexible' (see p. 16). Like a ceiling-rose, it has a porcelain base fitted with brass screws to which the ends of the circuit wires are attached. Like a ceiling-rose, it has a screw-on porcelain cover. But there the resemblance ceases, for whereas the 'flexible' connected with a ceiling-rose remains connected permanently, the object of a wall-socket is to allow its 'flexible' to be instantly disconnected at will and, if desired, the 'flexible' of another fitting substituted.

This is achieved by means of a **plug** which fits into the socket. The term 'wall-plug' is often used loosely for the wall-socket, but, as they are two entirely separate things, it is well to

keep them quite distinct in the mind. The plug is a little porcelain arrangement consisting of two parts. One part is furnished with two brass pins or pegs, split down the middle, which pass right through the material and project outside the plug from $\frac{1}{2}$ to $\frac{3}{4}$ inch. To the ends inside the plug the wires leading to the fitting are attached. The other part of the plug is the screw-on cover of the same material, through a hole in the centre of which the wires leading to the fitting come out.

In order, then, to connect the lamp with the circuit, all that has to be done is to insert the two projecting pins of the plug into two little brass tubes which are arranged side by side in the socket and to which the circuit wires are connected by means of the brass screws.

The above is the ordinary type of 'two-pin' plug and socket. There is another kind called the 'concentric,' which has its advantages, but is rapidly becoming obsolete. It is not described in this book, because the 'two-pin' has superseded it, and because anyone who has it already in his house, and who has grasped the principle on which the 'two-pin' pattern is made, will see at a glance, on unscrewing the covers of the plug and socket, how the two differ in construction.

There are several objections to the simple plan of inserting a plug in its socket whenever one

desires to turn on a light. It is a good deal of trouble; it is bad for the tubes in the socket; and it wears out the 'flexible.' All these objections are got over by the use of **switch plugs,** which have an arrangement by means of which a slight turn of the plug to the right turns on the current. These plugs possess the additional advantage of satisfying the most stringent requirements of the insurance companies.

A **twin plug** is a plug which enables two 'flexibles' to be connected simultaneously to one socket. It is a cheap and sometimes convenient way of supplying current to two lamps in a drawing-room or bedroom.

The actual *position of the sockets on the wall* is an important matter, and one which must not be forgotten in thinking out the installation. Their *position in each room* will be discussed when we come to consider each room in turn.

With switch plugs the most convenient point is about 3 feet or 3 feet 6 inches from the floor. The wires are brought up from below, either on the surface in wood casing, which is ugly, or under the surface in a steel tube. The process of cutting a ditch in the wall in which to lay the tube is called 'chasing' the wall. The second plan is obviously neater, but more expensive than the first.

When ordinary sockets and plugs are used, the

sockets may either be placed on the wall immediately above the skirting-board or sunk flush in the skirting-board. The advantage of these positions is their inconspicuousness; the disadvantages are (1) the possible difficulty of getting at them on account of the furniture, and (2) the liability of the 'flexible' to injury from the housemaid's brush.

The worst position for a socket is on the surface of the skirting-board. One constantly sees sockets only two or three inches from the floor, where they are liable to be damaged every time a neighbouring piece of furniture is moved.

Flexible.

Flexible wires, or 'flexes,' as they are commonly called, are the wires leading from a ceiling-rose, wall-plug, or fitting to the lamp-holder. They consist of a pair of wires twisted together, each of the pair being composed of a number of strands of fine copper wire. Each of the two main wires is insulated with indiarubber, cotton and coloured silk. In the case of a bracket, the colour of the flexible should be chosen to harmonize with the wall-paper. For pendants, maroon is a useful colour. For standards, it is well to choose a colour not too much resembling that of the carpet—otherwise someone will sooner or later trip over the flexible, and probably damage either himself or the fitting, or both.

Were it not for the enormous convenience of flexible, it would be undoubtedly safer to use it for nothing but brackets and pendants. Whenever it is used, in conjunction with wall-plugs, for standards, there is a possibility of its giving trouble. If the flexible is the ordinary length, it inevitably lies on the floor, and the rapidity with which an energetic and careless housemaid is capable of 'dusting' through its outer insulation must be seen to be believed. Every time it is trodden on, every time it gets kinked, the risk of a short circuit between the conductors is increased, and a short circuit *may* mean a fire. The most vulnerable point is where the flexible emerges from the plug, and here special measures should be taken to protect it. A simple plan is to cover each of the two wires separately for a couple of inches with a layer of indiarubber tape.

Objectionable as, in theory, the flexible of a standard is, it is recognised as a necessary evil; and, as a matter of fact, if the regulations as to fuses and switches are complied with, and the flexible is examined from time to time, and renewed whenever 'bad places' are discovered, the risk of an untoward incident is reduced to a minimum.

Lamp-holders.

A **lamp-holder** is the device by which a lamp is connected with the wires supplying it with

current. There are two principal kinds—the 'bayonet cap,' or 'B.C.,' and the 'screw socket.' These names refer to two different means of fixing the lamp into the holder (see p. 24). For all ordinary purposes, the *bayonet-cap* form of holder is the one to use.

It consists of a brass socket into which the 'cap,' or metal end of the lamp, fits comfortably. At the bottom of the socket is a piece of porcelain supporting two little brass cylinders, to each of which one of the two wires is connected. In these cylinders are springs which, when the lamp is inserted in the socket, press little brass rods against the contact-pieces of the lamp, not only making a good connection, but keeping the lamp firm in the holder. The lamp is inserted by being pushed in so that the pins projecting from the sides of its cap pass down the slots cut in the sides of the socket; it is then given a slight turn to the right, and the pressure of the springs holds the pins tight in their proper position. Care must be taken, in putting in a lamp, that a really good contact is secured.

A few moments' inspection of a holder will make its working clear. Do not experiment with any holder which is in use without making quite sure that the current is turned off from the fitting. To take it to pieces, unscrew the milled ring.

To put it together again, use care and common-sense. It will probably be more prudent to ask to see it done in a shop.

Most holders have *two* milled rings; then the one which comes off first is called the **shade-carrier,** because it is used to grip a shade, when one is used, between itself and the other ring mentioned in the last paragraph.

Sometimes the holder contains a switch, the handle of which projects at the side. It is then called a **key-holder,** and is still better worth dissecting. Some insurance companies object to 'key-holders,' except in pendant fittings.

When a holder hangs at the end of a flexible, it is provided with a **cord-grip**—two little pieces of wood which grip the flexible tightly and take the weight of the holder, lamp and shade off the ends of the 'flex.' This also is easily intelligible on inspection.

Switches.

Mention has already been made (p. 5) of the main switch, which controls the supply of the whole house. In principle, though not in exterior appearance, the subsidiary switches which control the various circuits throughout the house resemble the main switch.

The **Tumler switch,** as it is called, with its fluted brass cover, is familiar to everybody. Its internal arrangements, like those of the lamp-

holder, can be better understood from a minute's inspection than from ten lines of description. Unscrew the cover of an ordinary switch, and you will find the ends of the circuit wires coming up through the porcelain base and gripped by screws inside two little brass cylinders. You will also perceive the gap which is closed or opened, as the case may be, by a lever arrangement worked by the finger-knob. Under the lever is a spring, which causes it to 'break contact' instantaneously—an essential feature in a good switch. This investigation should on no account be attempted by an inexperienced person with a 'live' switch. But it is worth anyone's while to examine a harmless specimen in a shop.

The ordinary switch used about a house is 'single-pole'—that is to say, it affects one wire only of the circuit; the other wire passes by it uninterrupted.

Wherever a circuit has to be controlled from *two points*—as, for instance, in a bedroom—a **two-way switch** is required. In this, one of the most valuable of the minor accessories of an installation, the lever arrangement mentioned above works like a seesaw, closing one or other of two gaps alternately. Its object is to connect, not one wire to another, but one wire, A, to either of two others, B and C. Wire A therefore leads

to one side of each gap; wires B and C lead respectively to the other sides of the two gaps; so that, whichever gap be closed, either A and B are connected or A and C. Here, again, a short inspection of the thing itself will make its working clear. The external appearance of both ordinary and two-way Tumler switches is the same.

When it is desired to control a circuit from *more than two* points, as, for instance, on a staircase, **intermediate switches** are used in conjunction with the two-way variety. Intermediate switches differ from the Tumler in appearance and action, in that they have a cylindrical instead of a dome-shaped cover, and are worked by rotating the handle instead of by moving it up and down. The handle is always turned the same way—to the right. Instead of the lever and gap of the Tumler, there is an arrangement of brass strips which make contact with each other as the switch goes round. This is also the principle of the switch plugs mentioned above (p. 15).

Another type of switch, introduced comparatively recently, has a gap more or less like that of the Tumler; but, instead of a lever for closing it, there is a sliding-block arrangement, which enables the cover to be made much flatter, and therefore neater.

All the above switches are intended to be

permanently fixed in position on a wall. But it is often convenient to have a *movable* switch attached to the end of a flexible. For this purpose **pear switches** are used. They are generally made of wood, more or less in the shape of a pear, and the flexible enters through a hole where the stalk ought to be. They, too, have a sliding-block arrangement, which is worked by a wire rod passing through the sides of the pear. 'Two-way' pear switches are also common and extremely useful.

The cheapest way of putting up a switch is to screw it on to a wooden block which in its turn is fastened against the surface of the wall. Unfortunately, however, a switch is in itself an ugly thing, and the effect of a group of them together is particularly unattractive. The substitution of 'handsomely chased' covers for the common ones, so far from improving matters, merely makes the affair more conspicuous.

If cheapness is the first object, there is no help for it. It is, indeed, possible to cover a switch on a wall with a metal plate of a more or less decorative kind; but unless the plate is fairly large there is no object in it, and if it is at all large it is unduly conspicuous itself.

But if you are prepared to spend an extra pound or so for the sake of appearances, there is no doubt that the best way of treating all

switches in the 'show' parts of the house is to *sink them in the wall.* If the wall is not perfectly dry this cannot be done, but if it is, the switch should be let into the wall, and covered by a small flat metal plate through a hole in which the knob or handle of the switch projects. Even when there are a number of switches together, with one plate covering them all, the effect is neat and inoffensive. Metal plates intended for covering sunk switches are to be found in many shops, but most of them are needlessly large and over-ornamented. It is quite unnecessary to make a 'feature' of them. Switches are merely taps, after all; so long as the plates are not unpleasant to the eye, one need not waste money on their adornment.

The Position of Switches.

Switches are generally placed unnecessarily high above the floor. In rooms, unless there is good reason to the contrary, they should be on a level with the door-handle. They are always fixed on the handle side of a doorway, and one's hand instinctively goes to the level of the handle in the dark. Nurseries are an exception (see p. 69). For halls, passages, or staircases, 4 feet from the floor is a suitable height. The householder should himself decide the actual position of each switch.

CHAPTER III

LAMPS

Description of incandescent lamp—'Ageing' and life of lamps — Candle-power — Clear and obscured lamps compared—Advantages of the latter.

THE **incandescent** or **glow** lamp has next to be considered. This beautiful invention, without which electric lighting for domestic purposes would be practically impossible, consists, as the reader knows, of a more or less pear-shaped glass bulb, with a brass-covered stalk or 'cap.' The cap is either cylindrical, with two projecting pins, when it is a 'bayonet cap,' or formed like a screw, when it is a 'screw cap.' Inside the bulb is a carbon **filament** with one or more loops in it. In some 200-volt lamps there are two separate filaments. The ends of the filament are fastened on to platinum wires, which, passing through the glass and through the plaster of Paris or other insulating material which fills the cap, are finally soldered on to the two brass contact-pieces mentioned on p. 18. Thus the current enters by one contact-piece, traverses the filament, which it makes white-hot, and passes out by the other contact-piece.

The lamp bulb, in the course of manufacture, has had almost all the air pumped out of it—otherwise the filament would be burnt up in an instant the first time the current was turned on.

It is interesting to observe how far short the lamp falls of being a perfect vacuum by holding a worn-out one under water in a basin and nipping off its little nose with a pair of pliers. The water rushes in with considerable force, and in a few seconds the lamp is nearly full; if the vacuum had been perfect it would have been quite full. When a lamp breaks, which it does if dropped on something hard—though it is astonishing how much rough treatment a lamp will stand without either the filament or the bulb breaking—there is a sharp 'pop,' and the neighbourhood is strewn with infinitesimal fragments of glass. If the force of the explosion were outwards instead of being, naturally, inwards, the result would no doubt be more alarming.

If a lamp which has been some time in use is held in daylight against a piece of white paper, it will appear dirty, and an attempt to wash it will reveal the fact that the dirt is *inside* the glass. The fact is that all the time that a lamp is burning tiny fragments of carbon are flying off the filament and coating the inside of the bulb. This process is doubly unfortunate, because, while the glass is growing steadily sootier and

less transparent, the filament is growing thinner, is giving less light, and is becoming more and more likely to break at any weak spot.

This increasing dirtiness, or 'ageing,' as it is called, of the lamps is a serious matter to the consumer. It would be some consolation if, when a lamp gave less light, it used less current, but this is not the case. If, therefore, the proper lighting of the room depends, as it should, on the lamps giving something not far short of their specified candle-power, do not hesitate: the moment a lamp seems to be burning dimly while others seem all right, throw it away.

An ordinary lamp is supposed to last 1,000 hours. This is not found to be so in practice. Occasionally, indeed, one comes across a lamp which seems endowed with eternal youth; but this must be regarded as at best an amiable freak. Sooner or later the filament will snap, and the chances are that it will choose the most inconvenient moment for doing so.

The useful life of an ordinary lamp probably does not exceed 800 hours; but 800 hours is a long time. In January, for instance, a lamp burning continuously six evenings a week, from the legal sunset till 11 p.m., would only get through 180 hours, or thereabouts, of its life, and in July only 65 hours. As a matter of fact, however, very few lamps in a private house,

except one in the front-hall (see p. 47), do, or, at all events, need, burn continuously nearly such long hours as these.

There are several good makes of incandescent lamp, but there is only one best, and that is neither made in Germany nor the cheapest.

Lamps are made to give a certain **candle-power** (generally written **c.p.**) when a certain current is passed through them. Thus, lamps taking 100 volts are made of 5 c.p., 8 c.p., 16 c.p., 25 c.p., 32 c.p., and so on. A similar range of candle-power is to be found in lamps of a higher voltage. The proper voltage and intended candle-power are always marked on the lamp—thus, for example, 100-8. The candle-power is based upon the *horizontal* rays—*i.e.*, those which come from the side of the lamp. It is important to remember that a lamp which gives, say, 8 c.p. at the side does not often give more than 5 c.p. at the top. It is also well to remember that, as a lamp does not continue to give its nominal candle-power for long, a room with an outfit of new lamps should appear rather overlighted than otherwise. If it is right to start with, it will probably be underlighted long before the lamps are worn out.

Obscured lamps are those which have had their glass made dull by means of a sand-blast. Fine sand is blown against the glass by a strong

current of air, and its particles cut tiny pieces out of the surface, leaving it dim and rough instead of smooth and clear. The object, of course, is to diffuse the light and protect the eye from the painful glare of the unobscured lamp. Most people who look for a moment at a clear lamp burning a few feet away will, to their great annoyance, see for an appreciable time afterwards a greenish image of the filament on everything else that they look at. There can be no doubt that the use of clear lamps, especially for reading, sooner or later damages the eyes.

But the great advantage of the obscured lamp lies in the fact that it diffuses the light far more evenly than the other kind. A well-lighted room is one in which there are no violently bright spots, casting proportionately dark shadows, but an equally distributed and pleasant glow. With clear lamps it is necessary, if the lighting is to be at all tolerable to the eye, to temper the harsh glare of the filament with 'shades' of considerable opacity—which means a great loss of light. Attempts are sometimes made to employ *reflected* light—that is to say, the lamps are more or less entirely hidden from the eye, and the light is reflected into the room from the walls and ceiling. This method has to be carried out on a large scale to be really satisfactory, and

for this and other reasons is not to be recommended for a small house.

With obscured lamps, it is true, one loses 15 to 20 per cent. of the light in any case, but the 85 or 80 per cent. which remains, coming as it does from the whole surface of the lamp, instead of only from the narrow filament, is so much better diffused and more agreeable to the eye that practically no further shading is required, except for the sake of ornament.

It does not, therefore, follow that, because a clear lamp gives more light than an obscured one, a house can be equally well lighted with fewer clear lamps. On the contrary, if the clear lamps are shaded to the extent which they should be for comfort, just as many of them will be required as if they were obscured. An unshaded clear lamp is an abomination, and it is surprising how many houses, otherwise delightful, fall short of perfection in this respect. If anyone who now uses clear lamps will substitute obscured ones, as the clear wear out, he will be surprised to find how much more comfortably his house is lighted. An obscured lamp costs 1d. more than a clear one, but it is very well worth the money.

The reader is confidently recommended to have obscured lamps, and obscured lamps only, in all parts of his house.

CHAPTER IV

FITTINGS

Choice of fittings — Ceiling-plates — Pendants — Cord ornaments—Movable pendants—Adjustable pendants —Brackets—Candle fittings—Various types of glass and other shades—Floor standards—Table standards —Shades for standards.

On choosing Fittings.

HOWEVER much the reader may be disposed to think that the matters hitherto discussed may safely be left to those whose business it is to know about them, he is now entering upon a branch of the subject in which it is essential that he should take a close personal interest—if, that is to say, he wishes his house to have a character of its own. It is to be hoped that anyone who reads this book would prefer his house to be lighted like that of a gentleman rather than like 'furnished apartments' or a railway hotel. If so, he must take the trouble first to form a pretty definite opinion as to the kind of fittings he wants, and then to go himself and choose them. It is seldom wise to rely upon the advice either of the electrical expert, be he consulting engineer or contractor, or of the shopman. The former may be a most com-

petent electrician and a thoroughly respectable man, and yet have the worst possible taste in fittings. The latter, naturally, is concerned rather with selling his wares than with adorning his customer's drawing-room. And yet people constantly 'leave it,' as they say, 'to the man'! The result is seen in houses in which all the fittings are good, and yet all are commonplace. More often they are commonplace without being good.

Choose, then, your fittings yourself, and in doing so remember three things:

First, that a fitting looks very different with and without a light in it. Always insist, therefore, if there is anything ornate about it, on seeing it lit up, and placed in approximately the same position with regard to your eye as it is intended to occupy in the house.

Secondly, that the 'quietest' fittings are those which prove most satisfactory in the long-run. There are fashions in fittings as in everything else, both in style and in material. At one time wrought-iron was all the rage. Its leading characteristics were a multiplicity of curls and wriggles—scroll-work, as it is called—or else an abundance of tortured flowers and leaves. It often reminded one of a plant which has run to seed. Its general effect was dingy, and it almost inevitably collected dust. May the day be far distant when wrought-iron 'comes in'

again! Meanwhile wrought-iron has been succeeded by plain or beaten copper or brass, either plain or 'treated' in various ways—oxidized silver is one of several attractive kinds of 'finish'—and there has recently been a very great improvement also in designs. It is gradually becoming recognised that good 'lines' are worth any amount of ornamentation. The function of a fitting is to support a lamp, not to attract attention to itself. By day, indeed, it should attract no attention at all; but when at night it is revealed as part of the decoration or furniture of the room, it should please the eye rather by its graceful simplicity than by its elaborate detail. Of course, if a room is furnished or decorated in a definite style, the fittings should harmonize with that style; but it is quite unnecessary to cover the walls with bunches of imitation candles simply because some of your chairs or tables are called 'Louis XV.' or 'XVI.' The objections to candle fittings will be found under 'Brackets,' p. 37.

Thirdly, that a really satisfactory set of fittings is not to be collected without a certain amount of trouble. Do not expect to find everything that you want in one shop. There has been in the past an enormous production of inartistic fittings. It took designers a long time to shake off the old 'gas-pipe' traditions, and when they did so

they went to the opposite extreme. The over-elaboration of ten years ago is now being superseded by far chaster designs, and to-day it is possible, by taking thought, to secure an outfit of artistic designs at quite reasonable rates. Nevertheless, there is still a deal of rubbish to be sifted before one comes across the 'right thing.' Inspect, therefore, the contents of several show-rooms, see what there is in the market before buying, and take as much time over it as you can spare. Fittings bought in haste too often have to be 'lived down' at leisure.

Fittings may be divided into—

(1) Those which hang down from the ceiling.
(2) Those which project from the wall.
(3) Those which stand on the floor or table.

Ceiling Fittings.

The simplest form of ceiling fitting is a **ceiling-plate.** This is merely a circular metal plate which is fixed, like a ceiling-rose (see p. 12), to a wooden block in the ceiling, and has a thread on to which the lamp-holder itself screws. It is often ornamented with leaves of hammered metal, and is then suitable for lighting passages throughout the house, though it is apt to get very dusty. The plain variety is used for basement passages, lavatories, and the like, and may be fixed equally well to the wall when

the ceiling is for any reason not approved. It is a neat and unpretentious fitting, very useful in a small house.

Next comes the **pendant,** or fitting hanging by a flexible, which ranges in elaborateness from the common or office variety, with its plain 'opal' shade, to the most intricate and expensive arrangement of 'dead gold' brass or beaten copper.

Pendants are either fixed or movable.

'Fixed' pendants are merely lamp-holders, with more or less decorative appendages, hanging at the end of a fixed length of flexible. The baldness of the 'flex,' where it exceeds about 2 feet in length, may be much mitigated by the use of a simple **cord ornament**—a metal arrangement harmonizing with the rest of the fitting and slid up the 'flex' to a point halfway between the lamp-holder and the ceiling-rose.

'Movable' pendants have a china or metal counterweight containing shot. By means of pulleys, attached to the counterweight and ceiling-rose respectively, through which the flexible passes, the height of the lamp from the floor can be varied several feet at will. This is a great convenience whenever light is required nearer the floor than usual, as for looking into the lower shelves of a wardrobe or for any other purpose. It also enables the lamp and shade to be easily dusted. All pendants in bedrooms,

nurseries and kitchens should be of the counterweight type.

It is occasionally convenient to be able to tip up the lamp and shade of a pendant, so as to direct the light temporarily in one particular direction. For this purpose 'adjustable' pendants are employed, which may be tilted at any angle, and will remain in any position that is desired. The newest form of 'adjustable' pendant has only one counterweight instead of the three required by the earlier patterns, and is both neat and inexpensive. But for private houses there is seldom any real advantage in 'adjustable' pendants over the ordinary type.

Of the more elaborate pendants, containing several lamps, it may be said that, while good designs are becoming more common than they were, there is little use for them in a house of moderate size. Few front-halls require more than one lamp in any given place, and good single-lamp pendants are easily found. A small dining-room or drawing-room—for reasons which will appear in due course (pp. 51, 52)—had much better not have any pendant at all. But if a pendant be insisted on, it should on no account be massive or complicated in design. The 'handsome' pendant of the show-room is apt to prove merely a heavy bunch of metal when it dangles from the ceiling of a private house.

Brackets.

All the kinds of fittings which are intended to project from the wall are called 'brackets.' They are screwed on to wooden blocks, which are either fastened on to the wall or sunk in it. The latter is the neater plan.

In view of the fact that brackets are used in all the principal rooms of a house, it is important to realize, before attempting to buy them, the characteristics of the two main types. These two types are:

(*a*) Those which have the lamp fixed directly on to them.

(*b*) Those from which the lamp is suspended by a piece of flexible.

Brackets of the (*a*) type range from the most austere form of 'gas-pipe fitting,' through the 'highly-chased Louis XV.' or 'XVI.' candelabra, to complicated groups of flowers or Cupids in uncomfortable attitudes bearing lamps.

Of these, the 'gas-pipe' or hotel variety is to be the most carefully avoided. It is always ugly, and in its worst form—that in which the lamp projects downwards into the room at an angle of 45° from the wall—it is intolerable from the artistic, and absurd from the electrical, point of view. Mention has already been made of the fact that the candle-power given by the top of a lamp is little more than half that given by

the sides. The combination, therefore, which is only too frequently met with, of a hideous bracket holding out into the room the top of a clear lamp in an open and worse than useless glass shade, can never be sufficiently condemned. It is bad anywhere, but particularly abominable in a gentleman's private house.

'Candle fittings' are comparatively harmless, though there are objections even to them. In the first place, their imitation candles don't *look* real, any more than the steady glow of their lamps looks like the living candle flame. In the second place, the pretended illusion requires them to have candle shades, which soon get dirty. But anyone who does not mind an unsuccessful imitation, coupled with dirt and expense, may safely go in for candle fittings. Probably their only advantage is that they enable genuine old candelabra and chandeliers to be adapted for electric light. Lamps with miniature bulbs of the ordinary shape will be found far more satisfactory than those intended to represent the flame of a candle.

The more complicated kinds of wall fittings—flowers, Cupids, and so forth—are hardly likely to be desired by the reader of this book. Good ones are expensive, and in any case they are not in keeping with the ordinary small house.

Brackets of the (*b*) type are to be found in

every degree of elaboration, but are all distinguished by the fact that the lamps hang from their extremity by a short length of flex. This is undoubtedly the best type of bracket for all ordinary purposes. In the first place, the lamp is vertical, so that the room gets the advantage of the greatest amount of horizontal rays. In the second place, the height of the lamp from the floor can easily be altered a few inches by putting in a new flex, if at any time a change of 'shade' or some rearrangement of the furniture suggests that such an alteration would be an improvement, whereas when the (*a*) type of bracket is once fixed, there it is, and alteration (without damaging the wall-paper) is practically impossible.

Shades.

Before proceeding to consider the third branch of fittings—standards—it will be well to discuss shades. The term **shade** is used to describe any kind of appliance, decorative or otherwise, which is intended to diffuse the light of a lamp, whether it merely covers the lamp like a saucer or more or less completely surrounds it.

There are three main types of glass shade: (1) the conic, (2) the bell-shaped, (3) the 'pine.'

(1) The simplest form of shade is the plain conic 'opal' shade commonly used in offices. It

consists merely of a circular piece of whitish glass in the shape of a shallow funnel. The lamp-holder is inserted at the small end of the funnel, which is suspended from it by means of the shade-carrier (see p. 19). In private houses it is only suitable for basements and upper floors.

(2) The bell-shaped form of shade has no distinctive name, but is simply called a 'shade.' It is really a more elaborate form of the conic pattern. The lamp-holder is inserted, and supports the shade, in the same way; the essential difference is that the shade projects, or ought to project, considerably further from the lamp-holder than the lamp does. In other words, the lamp is entirely covered by the shade, except at the end furthest from the holder. The fact that rays passing through the open end of the bell come just as directly from the lamp as if the shade were not there at all seems to be ignored by those who use the brackets condemned on p. 37. A tasteful shade, hanging *perpendicularly* from a bracket, is permissible, because no one keeps his eye underneath, and, if small shades with correspondingly small lamp-bulbs are used, is rather effective; but on these conditions only should bell shades be used at all.

(3) The 'pine' is a shade in the form of an acorn (without the cup) or a fir-cone. It differs from other shades in that it covers the lamp

completely, so far as the eye of the spectator is concerned. It also differs in requiring to be supported by a metal frame or gallery attached either to the fitting or flex above the lamp-holder or to the lamp-holder itself. In principle the pine is a bell shade upside down. Whereas in the bell shade the mouth of the bell hangs downwards and the lamp-holder is inserted through a small hole in the top end, in the 'pine' the mouth is uppermost, with the lamp-holder merely hanging inside it, and at the bottom the glass ends in a point.

For all the 'best' parts of a house, a 'pine,' whether it be used for brackets or pendants, is the most suitable form of shade. It is also easier to find good patterns in 'pines' than in 'bells,' and of the two types the 'pine' gets dirty much less quickly.

A good plan for keeping dust out of 'pines' is to cut a disc of card to fit neatly just inside the mouth of the 'pine,' with a hole the size of a halfpenny (1 inch in diameter) for the lamp-holder to pass through. When you renew it after a few months, you will be surprised at the amount of dirt collected on its upper surface.

The actual choice of a shade is obviously a matter of individual taste. There are 'iced' shades, which look cracked all over, and are effective light-diffusers, very suitable for halls,

passages, and rooms with dark or strong-coloured papers. There are 'cut' shades, which always remind one of decanters. There are various kinds of 'opalescent' shades, which look well almost anywhere, especially the 'satin opalescent' variety. There are various kinds of 'prism' shades, which are useful in the more utilitarian positions, but require clear lamps.

There are also 'bead fringes' and 'silk fringes,' which hang perpendicularly from a 'gallery,' and do not appear to have any advantages whatever.

The shades for 'standards' are a different kind of thing altogether, and will be considered presently (p. 42), as will also be the shades for large pendants (p. 52).

Standards.

Fittings which stand on the floor or table are called 'floor standards' and 'table standards' respectively. They all, essentially, consist of a more or less ornamented metal tube, with a wide and generally heavy base at the bottom and a lamp-holder at the top. A flex passing inside the tube connects the lamp-holder with a wall-plug. Take care to order all standards to be sent home 'wired' with flex of the proper colour.

Floor standards are made to extend telescopically, and are either clamped at the required

height with a thumb-screw or remain there automatically by means of an internal spring arrangement. Six feet to the top of the lamp is a good height. Floor standards are best suited to drawing-rooms, but may, of course, be used in studies or boudoirs if these are big enough. A well-designed floor standard is a difficult thing to find—and expensive. It should combine grace and simplicity in its lines, and be very firm on its feet. Together with the brackets, it should be made of the same metal, whether brass or copper, as the fender and coal-scuttle.

Table standards of good design are also hard to find, though the purchaser has a much larger choice. Very few of the more elaborate kinds are satisfactory. Avoid a mass of scrolls or flowers or leaves. For bedrooms the 'adaptable' type of standard is the best. These useful fittings are made so that they will either stand on a table or hang from a rail of the bedstead or a nail in the wall. The nail plan is, perhaps, preferable. Unless the rules of the insurance company forbid them, key-holders (see p. 19) in table standards are to be recommended as exceedingly convenient.

Shades for Standards.

With all standards the great difficulty is to get good shades. Standard shades are made

either (1) of linen, painted or plain, with or without accordion pleats, or (2) of silk.

The latter look delightful in a show-room, but are only to be recommended for private use if you are prepared to renew them every few months—a very expensive amusement. It is not easy to dust a silk shade at all, and however carefully it be dusted it can never be kept really clean. Furthermore, a silk shade, when the lamp is not burning, is a gloomy, cumbrous thing. It must be remembered that with oil-lamps the shade is not brought into the room until the lamp is required, whereas with electric light the shade is there all day long. Hence the importance of avoiding heavy-looking shades.

Linen shades have none of the above drawbacks. They are easily dusted with a soft brush, they are light and cheerful in appearance, and they are comparatively cheap. In a drawing-room prettily painted linen shades are attractive by day as well as by night, while for a study table nothing is better than a plain accordion-pleated shade, open 3 or 4 inches at the top and 10 inches at the bottom.

Standard shades are supported by wire frames held in position by the shade-carrier on the lamp-holder. Silk shades are bought on the frames; for linen shades the frames have generally to be made to order.

CHAPTER V

HOW TO LIGHT A HOUSE

Need of forethought and imagination—Wall-papers to be considered—Advantage of a good arrangement of switches — The front-hall—The staircase — The dining-room — The study, library, or den — The drawing-room.

THE reader is now, if he has mastered the foregoing details, better qualified than the average citizen to proceed on a tour through the house and consider the all-important questions of where to put the lights, where to put the switches, and what sort of fittings to use. These are questions which it is neither safe nor fair to leave entirely to the professional electrician, however skilled he may be in the technical details of his trade. Just as architects, if left to themselves, are reputed to build houses excellent for every purpose but that of living in, so electricians are apt to produce installations which meet all possible requirements except those of their particular client. But if the client does not know what he wants himself, it is unreasonable to blame the architect or electrician.

Everyone who ventures upon the task of light-

ng a house with electricity should set out with a sufficiently definite idea of his own and his family's requirements to enable the expert to carry out his wishes. He should have made up his mind whereabouts in a room he wants to read, or write, or eat, or shave, or sleep. He should be able to realize, as he looks at an empty room, the future position of the larger furniture, so that he may not cause a bracket to be erected on a wall presently to be occupied by a tall cupboard. He should know by which of two doors he means to leave the drawing-room, so that when he goes down to dinner the hostess should not be under the deplorable necessity—this is no imaginary case—of leaving her gentleman and dashing across the room to turn off switches wrongly placed at the other door.

All this means a good deal of trouble. It is not as if one could have the current turned on in a general way and try experiments. The whole installation has to be completed and to be tested before the company will begin their supply. The whole thing has to be worked out, as it were, in the dark ; and it is surprisingly easy to make bad mistakes. But trouble taken over the details of an installation is well repaid in the long-run. When the carpets are down and the papers are up, it is exceedingly tiresome to make alterations, and many consumers are content to 'worry on'

for years with inconveniences which a little forethought and imagination exercised at the proper time would have prevented altogether.

An obvious way of getting an idea of what a room will look like when it is lighted up is to put good oil-lamps in the positions proposed for the fittings. Rules have been laid down as to the amount of superficial area which a lamp of a given candle-power will light properly, but the matter depends very largely indeed on the nature and colour of the wall surfaces. Some modern wall-papers absorb an astonishing amount of light. Forgetfulness of this fact leads sometimes to most depressing results. Before ordering a new paper, it is well worth while to try it first with electric light, to see what the effect will be at night.

The observations which follow are, of course, intended merely as suggestions. It would be absurd to attempt to do more than indicate the *possible* ways of lighting a house. The reader must decide, in conference with his expert, which of the various methods shall be adopted in his own case. At the same time, he will do well to realize, not only the general principles which should be kept in view, but the various objections which may be raised against any particular system of lighting. If the objections appear trivial, when considered on the spot, so much

the better; the reader will have lost nothing by having had them pointed out.

One of the great advantages of electric lighting is that the consumer need pay for no unnecessary light. In a house lighted with gas or oil, a lamp may burn for hours—say, in a bedroom passage or on a staircase—without doing any useful work whatever. Someone passes, and for a few seconds it justifies its existence; all the rest of the time it is merely wasting money. With electric light, on the other hand, given a proper arrangement of switches, not a single lamp in the house need be burning except while it is wanted. The effect on the quarter's bill of habitually turning out—or, rather, not turning on—any lamps that are not actually required is extremely gratifying to the consumer, while the ease with which the required amount of light can be regulated enables this economy to be practised without any of the unpleasant associations of 'doing things on the cheap.'

The Front-Hall.

In the front-hall there should be a lamp burning from dusk till bedtime, or, at any rate, till the last postman's knock.

At first sight, this may appear an exception to the rule that no lamp should be kept burning when it is not doing useful work. But, quite

apart from the practical fact that the hall is being frequently traversed all the evening, there is an æsthetic consideration which should on no account be neglected—namely, 'the feel of the thing.' Few people, it is to be supposed, are unconscious of the difference which it makes to one's feelings, as one stands waiting on a door-step, whether the hall is all dark within until lit up by the servant for one's own especial benefit, or whether it is already glowing with a friendly welcome. There is hardly any form of economy more unpleasing or less worth adopting than that of an unlighted hall. In one sense, of course, a hall lighted for the sake of appearances is a luxury, but, then, so is a polished bell-handle or a whitened doorstep. If a man can afford electric light at all, he can afford a lamp burning in his hall of an evening.

If, as is most usual, there is glass either in or over the front-door, or both, the light from a lamp at some distance inside will probably shed a sufficiently cheerful gleam through it. Or, again, a lamp over the door will not only illuminate the number, if there is one, on the fan-light, but will probably give sufficient light for passing to and fro in the inner hall. An obscured '5' is generally ample illumination for a fan-light, if the hall is of the usual narrowness and its paper as cheerful as it ought to be.

Whether there be a lamp over the door or not, there must be one for lighting the inner hall. This lamp will be used whenever guests are in the house, and during dinner every evening. It will probably not be far wrong if it hangs from the ceiling somewhere near the foot of the stairs. It should be an obscured '16' (this is one of the few cases in which an '8' is not powerful enough), and should be kept high enough to be well out of the way of a pair of steps, furniture, or luggage carried by on men's shoulders. The switch controlling the door lamp may be placed either just inside the door or together with those belonging to the hall lamp and staircase; better still, a two-way switch may be put in both places.

Another lamp will probably be required at the top of the kitchen stairs. This also may hang from the ceiling; an '8' will be ample. Its switch will be placed in the nearest convenient position.

The Staircase.

On every staircase landing there should be at least one lamp. Outside the drawing-room door there may be a couple of '8's' on a bracket, or a '16' hanging from the ceiling. One '8' would do for a very small landing, but this is an important place to light well. The greatest care

must be taken in fixing the exact position of these lamps, so that they do not leave any part of the staircase in shadow. While bearing in mind, therefore, the importance of keeping the lamps out of the way of things carried up and down stairs, do not forget that the stairs *must* be well lighted in both directions.

If there is a half-landing, an 8 c.p. lamp may be put there. It will only be needed on occasions of social gatherings, but on those occasions it will add greatly to the cheerful aspect of the staircase.

On each of the bedroom landings there should be an 8 c.p. lamp. The proper position for it will generally be obvious.

The back-stairs should similarly have a lamp on every landing at least. If the walls are light in colour, 5 c.p. lamps will generally be sufficient; otherwise use 8 c.p. It does not much matter where the lamps are fixed so long as they are high up and do not throw awkward corners into shadow.

All staircases should be lighted on the *up-and-down system—i.e.*, with double wiring and two-way and intermediate switches (see pp. 20, 21)—so that as one goes up (or down) one can turn on the lamp ahead of one, and turn off the one behind. This sounds rather troublesome, but if the switches are conveniently placed it becomes

a habit in a surprisingly short time, and even servants can be very quickly trained to do it, especially as any failure in this respect is certain to be detected.

The Dining-room.

The first thing to decide is how you like your *table* lighted—for the table is the *raison d'être* of the dining-room; the rest of the room is unimportant in comparison. The alternatives are, either to have a pendant over the table, or, on the *lucus a non lucendo* principle, to have no electric light at all, but only candles.

A *pendant* is, of course, the usual thing, but there are several objections to it which are worth consideration.

In the first place, it considerably reduces the apparent size of the room. Not only does it require a shade of considerable size over the table, but it also involves a point in the ceiling—a ceiling-rose, in fact—which arrests the eye as it wanders over the smooth surface, and by so doing automatically enables it to 'judge distance' and see how small the ceiling really is. Just as on a plain it is exceedingly difficult to form an idea of distance without some upstanding object to assist the eye, so with a ceiling one is apt to overestimate its size unless one's eye is caught by some protuberance which aids the sense of

proportion. Anyone who has had an obsolete gas 'ornament' removed from the centre of a ceiling will agree that the room looks ever so much larger without it.

The second objection to a pendant over a dining-table is its size. This applies especially to a pendant with the ordinary coloured silk shade beloved of the ordinary electrician. A silk shade is obliged to be big, or the distant parts of the table do not get enough light. It often reminds one of a broken-ribbed umbrella.

Another form of pendant is an arrangement of polished metal reflectors. This, when well designed, is an enormous improvement on the silken monstrosity, but it must be remembered that an artistic metal reflecting pendant is neither easy to find nor cheap. Also, if there be much substance in it, a metal reflector shares the disadvantage of the silk umbrella in tending to darken the room by day on the side away from the window.

Still another kind has a shallow basin of 'obscured' glass suspended under the lamps. With this one gets the advantage of the reflected light from the ceiling, and it is an effective fitting *if* the basin be kept scrupulously clean.

This brings one to a third objection, which applies to all pendants—they are troublesome to get at for the purpose of dusting. In the case

of those with silk shades, it is practically impossible to keep them clean with any amount of trouble, and the end of six months is apt to find them looking dingy and dilapidated.

If a pendant is to be used at all, it had far better be either the reflecting or basin kind than any arrangement of silk.

A fourth objection, which may easily be overlooked, is that a pendant has to be fixed halfway between the two sides of the ceiling. But it sometimes happens that one would like the dining-table nearer one side of the room than the other, perhaps to allow more space in front of the fireplace. Either, therefore, the pendant must be sacrificed (for one cannot have a pendant 'out of the centre' with regard to the table), or the table must be mathematically in the 'middle' of the room.

The alternative is *candles*. To these the obvious objections are, first, the expense, and, secondly, the risk of fire. In reply it must be admitted that good candles—and only good ones are worth buying—are considerably more expensive than electric light; it must also be admitted that, even with the best shade-holders, which are intended to move down automatically, a flare-up sometimes occurs.

But, on the other hand, the advantages of candles are so great that many people never

light their dining-tables in any other way. These advantages are—

1. They give far the most *becoming* light on a dinner-table. The soft radiance which they diffuse through their linen shades, the bright but never dazzling reflection of their light on glass and silver, even the pleasant 'living' movement of their flames—all these combine to enhance the appearance, not only of the company, but of the festive board itself. The great restaurants very properly recognise, by the use of real or imitation candles on their tables, the superior attractiveness of this method of illumination.

2. Candles, moreover, are more *decorative* than any other source of light. A good candlestick is in itself a beautiful thing. It harmonizes perfectly with the rest of the table equipment. Whenever fashion ordains the conversion of the dinner-table into a miniature jungle, the candlestick is the natural *point d'appui* for festoons of smilax.

Sometimes, it is true, one comes across a dinner-table lighted by a *standard*. But to this plan there are considerable objections.

The first is that the standard must have a big shade, and that this shade comes at about the level of the face, so that it shuts off from any given person a correspondingly big piece of the

view. It has, indeed, been known to obscure utterly an object of the greatest interest. The pedestal also takes up a good deal of room on the table.

The second is that it involves a flexible leading across the cloth and down to a socket in the floor under the table. This does not matter when the table is not fully occupied with people, but it is extremely likely to give trouble at a dinner-party. The flexible is in any case an undesirable thing, and not all insurance companies approve of floor-sockets.

Nevertheless, there are occasions when a table standard is exceedingly useful. At breakfast in winter, and at any time when fog comes on suddenly during a meal, there is a great advantage in being able to put a standard on the table, stick in the plug, and forthwith see to eat. For this reason, the provision, if possible, of a floor-socket under the dining-table may be recommended. It is inserted flush with the floor, and a little slit in the carpet, or a hole the size of a florin, admits the plug. The alternative plan of leading the flexible from the nearest wall-socket is seldom practicable, and never prudent.

It may be mentioned in passing that it is wise, when putting down a floor-socket, to put down also a similar socket (of a different colour, to avoid mistakes) for an *electric bell*. The flex for

this starts from pushes fastened under the rim of the table at convenient spots, generally the centre of the ends, and must, of course, be long enough to allow the table to be extended to its full length. The wires from the two ends meet at a point immediately above the socket, and when the table is in its 'small' condition are coiled up on a cross-bar out of the way. Nothing stronger than cotton should be used to tie them up, if this be found necessary; they are otherwise practically certain to be damaged when the table is extended. From the socket wires run under the floor to the bell, which is placed on the wall outside the pantry door, or in any other suitable part of the basement.

Even if there are no other electric bells in the house, it is worth while erecting this one. The comfort of it can be fully realized only by experience. Let no one, therefore, who is putting down a light-socket under his dining-table fail to put down, within a few inches of it, a bell-socket also.

With regard to the rest of the dining-room, even though the lighting of the table is the thing that really matters, it must not be forgotten that a different kind of illumination may occasionally be required. A large tea-party, for instance, will need much more light than a dinner-party. If, on the other hand, one wants

to read by the fire, a pendant over the table will probably be no comfort whatever. Two or three *brackets*, therefore, of the lightest possible kind, with or without a wall-socket and standard for the mantelpiece or side-table, should be provided, whether there be a pendant over the table or not.

In the back-dining-room a couple of brackets, to light the carving-table, will generally be sufficient.

The Study, Library, or Den.

On the writing-table there should be a standard so placed that the wet ink on the paper does not reflect its light. For reading, a table or floor standard, according to the arrangement of the furniture, will be most suitable. If more light is required for seeing the names of books in a bookcase, a bracket may be added, or even, if pendants are not objected to, a pendant.

The Drawing-room.

This is a difficult room to deal with, for in it the lighting has to satisfy a number of different requirements. A good result is only to be achieved by the expenditure of far more time and thought than is usually bestowed upon the matter. The ideal lighting will obviously be that which is equally suitable for one person

reading or writing in any part of the room, for a small party round a tea-table, and for as large a party as the room will accommodate.

Where the position of the furniture is fixed by custom or architectural conditions, the problem is, of course, simpler than where 'new arrangements' of sofas, writing-tables, and the like, are tried from time to time. In all cases, however, the great principle to be borne in mind is that of diffusing the light as evenly as possible throughout the room. The next worst thing to having too little light altogether is having too much light in any one place. No single lamp or group of lamps must be so bright that it cannot be gazed at comfortably, or so far from its neighbours that its shadows are not softened by their light. In other words, the right thing is to have many lamps of comparatively low candle-power scattered about the room rather than a few of higher candle-power in one or two positions only. A room which *could* be lighted with four '16's' will be infinitely better, as well as more economically, lighted with seven '8's.'

For a town drawing-room of average size the most useful system of illumination is a combination of floor-standards and wall-brackets. One *standard*, or at the most two, each with one '16' or three '8's,' will be found to give ample light for all ordinary 'domestic' purposes—*i.e.*, for

reading, working, or having tea. With the linen shades which are so much to be preferred to silk ones, they will not only brightly illuminate the particular chairs or sofa near which they are placed, but will suffuse the whole room with a soft and pleasant glow. They are, of course, supplied with current from wall-sockets.

A point to remember in fixing the position of these wall-sockets, one of which is usually placed on either side of the fire, is not to put the socket too near the mantelpiece. A very common position is just over the skirting-board, within a foot or 18 inches of the mantelpiece; but this is bad, because the flexible is apt to get mixed up with the coal-scuttle, and, if the standard is moved far out into the room, is liable to be interfered with by the legs of the chair or sofa nearer to the fire. There is no ideal position; every case must be decided on its merits.

In any case, the flexible of a floor standard is a nuisance. Quite apart from the technical objections already mentioned (p. 17), there is always a chance of tumbling over it. It is obviously out of the question to let it cross the carpet at any point where there is traffic to and fro, as, for instance, to the window or writing-table. But one of the advantages of a standard of any kind is its mobility. One *must* be able

to put it wherever, within the reach of its flex, one likes. The remedies, therefore, for an excessive length of flex upon the floor—often dangerous, and always unsightly—are either floor-sockets, like the one under the dining-table, described on page 55 (if one does not mind cutting holes in the carpet here and there about the room!), or additional sockets on the walls away from the fireplace side. As a matter of fact, the former alternative is seldom either approved or necessary: a couple of extra wall-sockets will meet the requirements of any ordinary drawing-room.

In default of floor standards, there should be table standards—unless, indeed, the furniture is so arranged that enough light can be got from the nearest wall-brackets for reading or writing wherever required. This, however, is not often the case. Even when it is, the middle of the room will probably require more light on 'company occasions' than the wall-brackets alone can supply; and in any case one can ill dispense with the friendly, comfortable effect which a lamp on a table gives. In a room with a paper which absorbs much light, standards, either on the floor or tables, are practically essential.

For 'company occasions,' however, *wall-brackets* will be wanted also. We have already considered (pp. 37, 38) the kinds of bracket which are most suitable for a gentleman's house. The

question is, where to put them. One thing is certain: *the general tendency is to put them too high.* The complaint which one occasionally hears, that electric light is 'unbecoming,' is largely due to the shadows under the eyes which result from this regrettable practice. In rooms 11 feet to 11 feet 6 inches high, the ideal position for brackets with glass shades will be found somewhere between 5 feet 8 inches and 6 feet high, measuring from the floor to the centre of the lamps.

The general proportions of the room should, of course, be taken into consideration in deciding the exact height for the fittings. This is a point which cannot safely be left to any outsider. Just as the ordinary British workman is incapable of hanging a picture either in the 'right' position, or at the 'right' height, or even level, so the judgment of the electric lighting foreman is apt to prove a blind guide in determining the proper position for brackets on a wall. He knows, of course, the 'usual' height; but the chances are that, in any given drawing-room, the 'usual' height will be wrong. Do not, therefore, leave it to him, but decide first what fittings you will have, and then think (hard) how they will look when the room is furnished.

Another thing which you will have to decide, unless all the lamps are controlled from the door,

is, which lamps you wish to be able to turn on as you come into the room. It is extremely inconvenient, if you merely wish to read by the fire with a table standard, to be obliged to turn on one or more brackets to see your way into the room, then to turn on your standard at the plug, and then to return to the door to turn out the brackets. In some cases this is inevitable, but it should be avoided whenever possible.

Nothing is said in this book about a **billiard-room**, because by the time a town house has a billiard-room it more nearly resembles in scale a country house. Billiard-room lighting is an art in itself, and, to be artistic as well as efficient, requires specially designed, and therefore expensive, fittings.

Nor, for the same reason, are the more elaborate methods of lighting reception-rooms by *reflected* light discussed; they are always extravagant, and not often satisfactory, even when money is no object.

CHAPTER VI

HOW TO LIGHT A HOUSE (*continued*)

The bedrooms and dressing-rooms—The nurseries—The servants' bedrooms—Lavatories and bathrooms—The kitchen—The scullery—The pantry—The servants' hall or housekeeper's room—The wine-cellar—The basement passages.

The Bedrooms and Dressing-rooms.

THERE are, perhaps, no rooms in the house where proper arrangements are more essential to comfort, or where they are more seldom found, than in the bedrooms and dressing-rooms. In the average bedroom one requires to be able to see perfectly at four points: (1) The dressing-table; (2) the wardrobe; (3) the bed; (4) the fireplace. Let us take these four points in order.

1. The dressing-table. This would seem to be the most difficult problem of all, for the attempts generally made to solve it are notoriously unsatisfactory. The usual plan is to have either one or two pendants (sometimes of the 'adjustable' kind) hanging from the ceiling above the table. The objections to this are: (*a*) that a lady's front-hair, or hat, throws a shadow on her face; (*b*) that she cannot see her

back-hair; (*c*) that a gentleman cannot see to shave; and (*d*) that it is almost impossible to avoid seeing the reflection of the lamp in the looking-glass, which, especially when the lamp is a clear one—an extremely common occurrence—is intolerably dazzling to the eye. The result is that, in many a bedroom abundantly lighted from the point of view of candle-power, it is extremely difficult to 'see oneself in the glass at all.' People do not seem to realize either that a lady *sits* at a dressing-table, or that a top light is, on account of the shadow, a thing to be avoided at all costs in a bedroom. Consequently, a well-lighted dressing-table is very rarely to be found.

There is, really, no difficulty about it when these elementary principles are grasped. All that has to be done is to screw on to the outer side of each of the two supports on which the looking-glass is pivoted an iron plate $1\frac{3}{8}$ inch long by $\frac{5}{8}$ inch wide, and $\frac{1}{32}$ inch thick. Up the centre of the outer surface of this plate is fixed a tube, also $1\frac{3}{8}$ inch long, and $\frac{3}{16}$ inch in internal diameter. The lamp is supported by an iron rod, $\frac{1}{4}$ inch square in section, which has $1\frac{3}{8}$ inch at one end rounded to fit comfortably in the tube, and terminates at the other end in a small and neatly tapered hook. The rod rises perpendicularly from the socket—say 6 inches—and then is curved gracefully forward at least $7\frac{1}{2}$

inches to the lamp. The lamp-holder is bronzed and of the 'miniature' pattern, and the lamp is an obscured '5,' with a small bulb and $\frac{9}{16}$ inch bottom collar to fit the holder. The lamp hangs from the hook by a maroon flex which passes directly from the 'cord grip' of the holder over the upper surface of the curved iron rod, being tied thereto at intervals with black thread, and so to the wall-socket, which, with a two-way switch, is placed in any convenient position hard by. The advantages of this plan are obvious:

(1) The lamp-brackets, as they may be called, are freely movable, so that the lamps may be swung instantly either right out of the way to the side or towards each other well in front of the glass.

(2) The lamps are on a level with the centre of the glass; they throw no shadows on the face, and are perfectly placed for doing the back-hair or for shaving.

(3) The whole fitting, being dark in colour and exceedingly light in make, is practically invisible by day; in so far as it is visible, the effect is very graceful and pleasing.

(4) The dressing-table can be instantly detached from the wall for dusting purposes by pulling out the plug.

(5) The miniature obscured '5's' give a pleasant and abundant light, and require no shades; they

are curiously long-lived lamps, and last, with ordinary use, at least a couple of years.

An alternative plan would be to have much longer iron 'brackets' springing from the *wall*. The objection, if any, would be that they would be less neat and manageable, and might conceivably be interfered with by the window-curtains.

In either case, to control the dressing-table lights, there will be an intermediate switch at the door and a two-way switch (a pear switch on a flexible is the most luxurious form) at the bed. This achieves that result which is one of the chief blessings of electric light—namely, that one need never go to bed in the dark. One turns on by the door on entering the room, or by the dressing-table if fog comes on suddenly while one is dressing; one turns off (under one's pillow, if one pleases) after getting into bed. Also, if one suspects the presence of a burglar in the night, one illuminates the room and brings one's pistol to bear before the burglar realizes that one is awake. For ghosts, too, it is invaluable.

The two-way switch at the plug is, of course, a mere luxury. If it be dispensed with, there will be a two-way at the door instead of an intermediate.

This system of lighting the dressing-table

cannot always be adopted, but where no objections exist it will be found an enormous improvement on the usual plan. Whatever the arrangement, it is essential for comfort that the light which one uses to go to bed by should be controlled equally from the door and from the bed.

2. The wardrobe. This is one of the instances where a pendant is undoubtedly the proper thing. It should be of the counterweight type, so that it can be pulled down to within a yard of the floor, and should have its own switch, either by the door of the room or at some other convenient point on the wall. It must hang far enough from the wardrobe to let the doors clear it comfortably, and near enough to illuminate well both the interior of the shelves and the wardrobe side of anyone inspecting herself in the looking-glass, if looking-glass there be. It is obvious that, if a person has to stand *between* the lamp and the looking-glass, the side nearest the looking-glass will be in shadow, and the brighter the light the deeper the shadow. Nevertheless, as in the case of the dressing-table mirror, one frequently finds this unfortunate arrangement, even in houses where no expense has been spared. An obscured 8 c.p. lamp in, say, an opalescent shade will give plenty of light for this fitting.

3. The bed. Here all that is required is an '8' on an 'adaptable' table standard (see p. 42). Take care that the socket for supplying this fitting is not placed in any position where it can be damaged by the bed's being accidentally pushed against it. The most convenient form of switch is a pear on a short length of flexible which will hang within reach of the pillow when the standard is hooked up on the wall. The best alternative is a switch-plug in the socket, though a key-holder or other switch in the standard may be permissible in certain cases.

In the event of two bedside lights being required at once, the one socket with a twin-plug will supply them both.

4. The fireplace. For reading by the fireside, an '8' on a table standard is required. Its flexible leads to a wall-socket near the mantelpiece. If there is uncertainty as to which side of the mantelpiece to put it, let there be one on both sides. The unused socket is often useful for supplying the bed when it is desired, for any reason, to move the latter nearer the fire. But here again a twin-plug may be made to supply both lamps from one socket, and thus save the expense of an extra socket.

Few bedrooms are so large as to require for the ordinary purposes of dressing more than the two '5's' at the dressing-table and the '8' in

front of the wardrobe. But if these be considered insufficient, you can either hang up the table standard, if there is one, on a nail over the washstand, or, if there isn't one, have a second pendant, with its switch on the wall hard by.

The dressing-room or small bedroom need not detain us. The dressing-table arrangement should be the same as in the larger room. No other light will generally be required for a room of 11 feet by 12 feet 6 inches. But for special occasions, or for reading in bed or by the fire, a wall-socket may be added, with a nail over the bed and another over the washstand for the accommodation of a similar 'adaptable' standard to that recommended above. When the dressing-room communicates directly with the bedroom, there should be switches at both doors.

The Nurseries.

The nurseries should have counterweight pendants and 8 c.p. lamps. Pendants are preferable to fixed brackets, because they 'give' if you hit them with any missile, and are thus less likely to break. In the nurseries, if in no other part of the installation, *obscured* lamps are essential, for the sake of the children's eyes. The switches should be placed at least 5 feet from the floor, for obvious reasons. Where the night-nursery communicates directly with the

day-nursery, there should be switches at the door between the two rooms as well as at any other door.

The Servants' Bedrooms.

Servants' bedrooms, if they are to have electric light at all, may have ordinary pendants, with 8 c.p. lamps, hanging in the most convenient positions for seeing to dress, and 'switched' at the door.

Servants being what they are, it is open to doubt whether, if economy be an object, they will not waste less money over *candles* than they will over electric light. Even if they do not read in bed—which they are much inclined to do—they have a way of leaving on the light in a box-room or any other room which is only occasionally entered. Instances are not uncommon of an empty upper chamber's being brilliantly illuminated day and night for three weeks or a month in the absence of the family. The great advantage of candles is the fact that whoever dispenses the household stores is able to keep a check on their consumption. Servants are not likely to read much in bed when they have to find candles for that purpose out of their own pocket. The danger of candles is no greater and no less than it always was. A suit-

able candlestick and proper table or bracket for it to stand on are obvious precautions.

Some householders have a switch whereby they can turn off the current from the servants' rooms at a certain hour every evening. This sounds delightful, but if there is a lamp on the servants' landing there has to be an extra circuit for the bedrooms; and if not, what happens in the case of illness in the night? One would also like to know whether the master of the house wakes up at six o'clock in winter so as to turn on the current for the servants to see to dress. It is to be feared that this arrangement does not do away with candles, after all.

Lavatories and Bathrooms.

Lavatories, bathrooms, and the like, may be lighted with plain ceiling fittings (see p. 33) and obscured '5's' or '8's' without shades, or with plain pendants.

The Kitchen.

Returning now to the basement, the question arises how to light the kitchen. Whatever doubt there may be as to the absolute advantages of electric light in servants' bedrooms, if you decide to have it there, you need have nothing else. But to light a kitchen, scullery or pantry with nothing but electricity is simply

tempting Providence. The only nights in the year on which electric light, if it means to go wrong at all, may be relied upon to go wrong, are those on which it is of vital importance that it should go right.

The sudden plunging of a dinner-table into darkness in the midst of the repast is an occurrence provocative rather of mirth than of despair. Even a newspaper may be brought out by the aid of candles stuck in the necks of bottles. But imagine a cook's feelings when the blow falls at the critical moment of a soufflée or a sauce!

Gas meets the difficulty, and since, as a matter of fact, gas is almost invariably laid on in any case for cooking purposes, it is easy to arrange burners which are only to be used in an emergency. One over the table, one by the range, and one in the scullery, should be ample.

As for the electric fittings, they cannot be too simple. Plain pendants with opal shades are commonly used over the kitchen table. The objection to them is that dust lodges in a surprising amount on the shades, and they require frequent cleaning. If the appearance of lamps without shades is considered unattractive, a clear 'pine,' covered at the top as described on p. 40, is sufficiently decorative, and in any case is preferable to a 'bell shade.' An obscured '16' or two obscured '8's' will give enough light in most

kitchens. The lamp by the range may be an '8' in another pendant or on a movable bracket. In the latter case it should be protected by a strong globe, lest it be accidently broken over an uncovered saucepan. The range lamp should have its own switch, but should also be controlled by the same switch at the door as the table pendant. This will render it less likely to be left on by accident when the cook goes out.

The Scullery.

The ordinary scullery will be amply lighted by an '8' in a ceiling fitting, with switch by the door.

The Pantry.

The pantry must be well lighted, and should have a '16' in a pendant like those over the kitchen table.

The Servants' Hall or Housekeeper's Room.

The servants' hall or housekeeper's room should have one or more pendants, according to its size, and, like the pantry, one switch by the door. These pendants should have counterweights, so that they can be pulled down for doing needlework.

The Wine-cellar.

A lamp (8 c.p.) in the wine-cellar is a great comfort. If there are bins on one wall only, it

should be in a ceiling fitting, high up on the opposite wall. If there are bins on more than one side of the cellar, the lamp may hang a few inches from the ceiling. The great thing is to keep it well out of the way of anyone handling wine in the top bins. It had better not have any kind of shade.

The Basement Passages.

The passages should be lit either with ceiling fittings or pendants. If the lamps have any shade at all, which is unnecessary, they may have a plain 'pine,' like the rooms in the basement, or some kind of prism shade. With the latter, clear lamps will be required. As there is no necessity for very brilliant illumination, except at the bottom of the back-stairs, 5 c.p. lamps will generally suffice, provided that the walls are light in colour and the ceilings properly whitewashed. The fact that, however much the servants may be supposed to turn out the light after them in the rooms of the basement, they will keep it on in the passage practically from morning till night is a sufficient reason for using lamps of as low candle-power as possible.

The amount of candle-power required will depend on the reflecting qualities of the wall surface, and the average cleanliness or otherwise

of the ceiling. With gas, as everyone knows, a basement ceiling quickly becomes black. With electric light the process of getting dirty is considerably slower, but equally sure. For this reason it is possible that, before the time comes for a general 'wash and brush-up' of the basement, a change from '5's' to '8's' may be necessary. This can be done in two minutes. Meanwhile the normal passage lamp should be a '5.'

Generally speaking, there is seldom any question as to the best position for basement passage lamps. It is advisable to have a lamp near enough the main fuse-board to make it easy to detect and replace 'blown' fuses. If there are electric bells in the house, there must be a lamp near enough to the indicator-board to illuminate it.

The switches should be as near their respective fittings as convenient, but should not project from the wall in any position where they are in danger of being injured whenever a big box, hamper, or pair of steps, is carried by.

Other apartments in the basement may be lighted on the same principles. The intending consumer will, however, probably need no urging to resist the temptation to multiply the number of lamps 'below-stairs.'

CHAPTER VII

SPECIFICATIONS AND CONTRACTS

Rules and regulations of insurance companies and other authorities—'Extras'—Date of completion—Subsequent maintenance by contractor—Sundry hints.

MOST of the technical expressions which the reader will find in his contractor's specification have been explained as they have occurred in the course of this book, and it is hoped that he will now be able to go through the document with understanding, and detect any important omissions or mistakes. Even if there were space here (which there is not) to give a typical specification at full length, it would not safeguard the consumer against the shortcomings of an inferior contractor. The most satisfactory, and probably, in the end, the most economical way to secure the proper execution of the technical part of the work is to employ a consulting engineer, who will exercise an independent supervision over the drawing-up and carrying-out of the specification. There remain in any case a few general hints to be given,

which, if they are followed, may save the consumer a good deal of trouble.

The most important thing to look out for is that the specification definitely states the name of the insurance company in accordance with whose rules the work is to be done. It should also state generally that the whole installation shall satisfy the requirements of the Board of Trade, the London County Council (if in London), and the supply company, and be in accordance with the Wiring Rules of the Institution of Electrical Engineers. A captious person might, indeed, object that, if all the rules which have been laid down were carried out to the letter, some of the most convenient applications of electric lighting would be rendered impracticable. This is true; but, as a matter of fact, so many installations which have been 'passed' by insurance and other companies would be found, on careful investigation, to contain features not strictly in accordance with the regulations that one is inclined to think that the rules are to be regarded rather as counsels of perfection than as being universally applicable to the requirements of everyday life.

By this it is not for one moment to be understood that the insurance company's regulations can safely be ignored. Wherever in the course of this book a method of lighting has been

suggested to which, owing to the particular circumstances of the case, an objection might be raised, the wisest plan will be to consult the insurance company before adopting it.

In ordinary cases, the process of being 'passed' by an insurance company merely means that the company send the contractor a form to fill up, stating that the work done is in accordance with their regulations, and this is accepted by them without further question.

In electric lighting, as in building, the customer is apt to receive a nasty shock when the bill comes in, on account of 'extras.' There is only one safe rule, at all events in electric lighting, and that is, to insist on a clause in the contract to the effect that for all 'extra' work there must be authorization in writing from the customer, and a written quotation from the contractor. The common practice of accepting an estimate, and then arranging verbally with the foreman, after the work has begun, to put, say, a couple more wall-sockets in the drawing-room, or to move a pendant a few feet one way or the other, is extremely undesirable, and constantly leads to misunderstandings. There is no harm in changing one's mind so long as one realizes what it is going to cost. Do not fail, therefore, to get everything outside the contract written down on paper. It is obvious that the more

thought is given to little details before the specification is accepted, the less annoyance there will be afterwards.

Take care that the date on which the whole installation is to be completed, and handed over in perfect working order, is mentioned in the contract.

It is not unreasonable to lay down that the contractor shall forfeit, say, 1 per cent. of the amount of the whole contract for every week's delay in completion. This, however, the contractor will hardly propose to do of his own accord.

Cases sometimes occur in which an installation, apparently in perfect working order, is discovered presently, perhaps on the first occasion that a spare room or some fitting not in general use is lighted, to have something seriously wrong with it. Some fuse, perhaps, will take to 'going,' or some switch will heat. It is disgusting to discover these defects after one has paid one's bill. The best plan is to make the contractor agree to maintain the installation in good order for twelve months from the date of completion, fair wear and tear being taken into consideration. Stipulate at the same time that he shall receive 95 per cent. only of the amount due to him on completion, and the remaining 5 per cent. at the end of the twelve months. It will make very

little difference to him, and all the difference in the world to you.

See that the contractor agrees to do all necessary cutting-away and making-good as neatly as possible, and to leave all builder's work that has been interfered with in perfect and decorative repair.

It may be prudent, if the contractor will agree, to reserve the right to call upon him to remove from the job any particular workman against whom you have reasonable ground for complaint. If a man insults your servants, sleeps, in his boots or otherwise, on your sofa during the dinner-hour, or makes himself objectionable in any similar way, it is a great nuisance not to be able to get rid of him. The contractor will probably object, on the ground that the man is a good workman, or that no other man is available; but the point is worth considering.

CHAPTER VIII

THE COST

Meaning of 'a pound a point'—Considerations affecting the cost—Prices of various fittings—Annual cost of current and lamps.

IT is customary to reply, to anyone inquiring what it will cost to 'put in electric light,' that it will come to about 'a pound a point.' If the inquirer thereupon says to himself, 'I mean to have sixty lamps in my house; putting in electric light will therefore cost me about £60,' he has a painful disappointment in store for him. The question is, What is a 'point'? Generally speaking, a 'point' means the whole apparatus and labour involved in bringing wires to a given position in the house. It includes not only the wires and their casing, but fuse arrangements on the distributing-boards, a switch, and either a wall-socket or ceiling-rose. Sometimes it is also specified to include a 'plain fitting,' which practically means a plain pendant, with flexible lamp-holder, lamp, and opal shade complete. A simpler plan is to regard the 'point' as ending with the ceiling-rose or wall-socket, in cases

where these are required, or with the ends of the wires which project from the walls at the places where brackets are to be fixed. A 'point,' therefore, includes no ornamental fittings. Perhaps it is hardly necessary to add that a 'point' is not the same as a lamp; there may be several lamps on one point, as in the case of a two-lamp bracket or a three-lamp floor standard.

The Cost per Point.

The cost per point depends, in the first place, on the materials used for protecting the wires, and whether the wires are run on or under the surface of the walls. If nothing were used but wood casing, the cost might be reduced to 12s. or 13s. a point. But very few installations can dispense with a certain amount of steel tube as well. If ordinary steel tube is used, the cost will be from 15s. to £1 a point; if water-tight steel tube is used, which is essential wherever there is any damp about, the cost will probably be not far short of £2 a point. These figures assume that there are no unusual structural difficulties to be overcome. If, therefore, the estimate exceeds £1 a point, it should mean either that water-tight tube is to be largely employed, or that there is something abnormally

expensive about the way in which the wiring is to be arranged. The sinking of switches in the wall adds about 3s. to the cost per point. These details should be carefully gone into before the estimate is accepted.

The Cost of Fittings.

The cost of the fittings, except where the 'plain' fittings mentioned above are already included, will be extra. One can spend, of course, anything one likes on fittings, but if another £1 a point is allowed for them, one can have a thoroughly good and tasteful outfit, suitable for the house of any gentleman of ordinary means.

In the dining-room, for instance, one need not spend more than 7s. apiece on brackets, nor in the drawing-room more than 10s. An excellent two-lamp bracket may be had for 16s. Oxidized copper table standards cost about 15s. A good polished brass floor standard may be found, though not easily, at about £3 15s. The 'adaptable' standard used in bedrooms costs 13s. or 15s. Ornamental ceiling fittings come to about 4s. 6d. Opalescent pine shades may cost from 1s. 9d. to 4s.; iced bell or pine shades, from 1s. 6d. to 2s. Linen shades for standards cost, with frames, small, 2s. 11d.; large, 21s. Silk shades for ditto cost—always more than they are worth.

The fittings which can be bought at the above prices are all perfectly plain; but it will be seen that, when allowance has been made for all sundries, such as lamps, lamp-holders, and flexibles, the estimate of £1 per point for fittings should allow an ample margin for indulging, if desired, in more expensive fittings for the 'best' parts of the house.

If you allow, therefore, £2 a point for the whole installation complete and in working order, you will be able to do the thing as well as any reasonable person can wish.

Annual Cost of Current and Lamps.

As to the annual cost of *current* in a house of the size contemplated throughout this book, no very useful estimate can be given. The author, using gas in the basement, and candles on the dining-table and in the servants' bedrooms, finds that electricity, at 5½d. a unit, costs on an average about £2 19s., including the rent of the meter, for each of the two *dark* quarters of the year. (The gas used during the same periods costs in addition, at 3s. a 1,000 feet, £2 16s. a quarter.) The two *light* quarters would probably cost about £1 less each both for gas and electricity. The low figure for electricity given above is achieved simply by using as much current as is

wanted, and no more. By means of a carefully arranged system of switches, no light is wasted, and certainly none is ever spared.

With the best *lamps* the cost of maintenance should not exceed 10s. a year.

CHAPTER IX

WHAT TO DO IN EMERGENCIES

Failure of lamp—Blown fuse—Heated switch—Fire.

A FEW words as to what to do in emergencies may be found useful.

1. If a lamp which is burning suddenly goes out, the first thing is to discover whether the filament has broken. Tap the lamp gently on the side, and if you see occasional little flashes you know that all is over with the lamp. The flashes are caused by the momentary contacts which the broken ends of the filament make with each other as they vibrate with your tapping. Turn off the switch, put in a new lamp, turn on the switch, and throw the old lamp away.

2. But a lamp may go out and yet the filament be as good as ever. If, therefore, you see no flashes on tapping it, try it in another fitting where a lamp is burning all right. If the suspected lamp burns all right in its turn, there is something wrong with its own lamp-holder, flexible, plug, or switch. In the case of a 'key-holder,' try turning on and off a few times; there

may be a bad contact. Then make sure that the current is 'on' at the socket by taking out the plug and trying the plug of another fitting in it. If the circuit is controlled by a switch, try if that seems to work all right and feels quite cold. Then examine the suspected plug. Perhaps the two halves of one or other of its split pins have been pressed together, so that it makes a loose contact in the socket; force them slightly apart by passing the big blade of a knife into the slits, and try the plug again. If nothing happens still, examine the flexible carefully; one of the wires may have come loose in the plug, or be broken right through by a jerk. If everything seems right, the trouble is in the lamp-holder. To remedy any of the three last defects you must call in 'the man.'

3. If a fuse 'goes,' which you will discover by all the lamps on a circuit being extinguished at once, turn off all the switches controlling those lamps and examine the fuses on the distributing-boards—first the subsidiary, if there be any, and then the main board. Pull out the carrier of the fuse which has melted, and insert one of the spare carriers which you keep handy ready wired, taking the greatest possible care not to touch anything but the insulated part of the carrier. Turn on the lamps again, and all will probably be well. If the new fuse 'goes' immediately, there is some-

thing seriously wrong, which should be 'seen to' at once.

It is most desirable that someone in the house should be capable of putting in a new fuse-carrier; fuses, like lamp-filaments, take delight in 'going' at the most inconvenient times, and it is absurd to be obliged to sit in the dark for half an hour when anybody of ordinary intelligence, who has been shown the way, can put the thing right in half a minute. But an electric current is not a thing to play with, and no one who is not thoroughly competent should attempt to put right anything that has gone wrong.

4. If any switch gets hot, turn it off and send for 'the man' as soon as convenient.

5. Lastly, in case of fire in any part of the installation, be sure to turn off your main switch before applying water, and do not turn it on again till you are authorized to do so by some responsible person.

THE END

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